AMENDMENTS TO THE CLAIMS

Because claims 27 and 28 are amended to respond to the examiner's objection as discussed under "Remarks," a complete listing of the claims, as amended herein, follows.

1. *(original)* A marine seismic source method, the method comprising;

generating an up-going and down-going wave with opposite polarity, wherein the up-going wave reflects off the ocean surface as a second down-going wave having the same polarity as the first down-going wave wherein the first and second down-going waves combine substantially in-phase to form a third down-going wave.

2. *(original)* The method of claim 1 further comprising detecting seismic waves produced from the seismic source with at least one motion sensor, or with both motion sensors and pressure sensors.

3. *(original)* The method of claim 1 wherein the generated up-going wave, the first down-going wave, and the third down-going wave contain frequencies of less than 10 Hz.

4. *(original)* The method of claim 2 wherein the motion sensors are selected from the group consisting of displacement, velocity, acceleration, higher derivatives of particle displacement, Doppler shift, pressure gradient sensors, and any combination thereof.

5. *(original)* The method of claim 2 further comprising an inversion applied to the recorded seismic data to reduce wavelet uncertainty.

6. *(original)* A marine seismic source method, the method comprising;

generating up-going and down-going waves through a seismic source device wherein at least part of the device is below the surface of the water and the device creates an up-going wave and a first down-going wave, wherein the up-going wave is created substantially near the surface of the water and has enough energy to break through the surface of the water into the atmosphere, thereby there is no significant

AMENDMENTS TO THE CLAIMS - *(Cont.)*

wave reflected off the surface of the water and the first down-going wave is the only significant wave produced by the source.

7. *(original)* The method of claim 6 further comprising detecting seismic waves produced from the seismic source with at least one motion sensor, or with both motion sensors and pressure sensors.

8. *(original)* The method of claim 6 wherein the first down-going wave contains frequencies of less than 10 Hz.

9. *(original)* The method of claim 7 wherein the motion sensors are selected from the group consisting of displacement, velocity, acceleration, higher derivatives of particle displacement, Doppler shift, pressure gradient sensors, and any combination thereof.

10. *(original)* The method of claim 7 further comprising an inversion applied to the recorded seismic data to reduce wavelet uncertainty.

11. *(original)* A marine seismic source apparatus comprising:

a seismic source device wherein at least part of the device is below the surface of the water and the device is adapted to cause oscillations below the surface of the water;

means for causing oscillations in the water to create an up-going wave and a first down-going wave and the up-going-wave has reverse polarity relative to the first down–going wave wherein the up-going wave becomes a second down-going wave with the same polarity as the first down-going wave after the up-going wave reflects off the surface of the water and the first and second down-going waves combine substantially in-phase to form a third down-going wave.

12. *(original)* The apparatus of claim 11 wherein the up-going waves, the first down-going waves, and the third down-going waves contains frequencies of less than 10 Hz.

AMENDMENTS TO THE CLAIMS - *(Cont.)*

13. *(original)* The apparatus of claim 11 wherein the device is a vibrating baseplate below the surface of the water and the means for causing oscillations in the water is a reaction mass above the ocean surface, the reaction mass housing a piston and a corresponding cylinder, the piston rigidly attached to the baseplate, the piston adapted to oscillate along the long axis of the cylinder when activated and means for activating the piston wherein as the vibrating baseplate is pushed down a compression wave is radiated as a down-going wave and a rarefaction wave is radiated as an up-going wave, wherein the compression wave is the first down-going wave and the rarefaction wave is the up-going wave.

14. *(original)* The apparatus of claim 11 wherein the means for activating the piston is a hydraulic system with fluid pressure from valves connected to the cylinder.

15. *(original)* The apparatus of claim 11 wherein the up-going wave, the first down-going wave, and the third down-going wave contain frequencies of less than 10 Hz.

16. *(original)* The apparatus of claim 11 wherein the device is at least two flexible membranes below the surface of the water comprising at least one upper and at least one lower membrane and the means for causing oscillations in the water is a supporting frame connected to the membranes, the supporting frame containing at least one drive mechanism adapted to oscillate the upper and lower membranes wherein the upper membrane oscillates out-of-phase with the lower membrane thereby generating an up-going wave from the upper membrane that has reverse polarity respective to the first down-going wave generated from the lower membrane.

17. *(original)* The apparatus of claim 16 wherein at least one drive mechanism is chosen from the group consisting of a hydraulic source, a pneumatic source, an electrical source, and any combination thereof.

AMENDMENTS TO THE CLAIMS - *(Cont.)*

18. *(original)* The apparatus of claim 16 wherein the up-going wave, the first down-going wave and the third down-going wave contains frequencies of less than 10 Hz.

19. *(original)* The apparatus of claim 11 wherein the device is at least two flexible membranes below the surface of the water comprising at least one upper and at least one lower membrane, and the means for creating oscillations in the water is a rigid frame, the upper and lower membrane connected to the rigid frame, the rigid frame adapted to controllably permit airflow from one membrane to another membrane and the membranes are adapted to expand when air enters a membrane and contract when air exits a membrane wherein an up-going wave is formed from the upper membrane that has reverse polarity to the first down-going wave from the lower membrane that is operating out-of-phase with the upper membrane.

20. *(original)* The apparatus of claim 19 wherein the up-going wave, the first down-going wave, and the third down-going wave contains frequencies of less than 10 Hz.

21. *(original)* The apparatus of claim 11 wherein the device is at least two marine vibrators comprising at least one upper marine vibrator that vibrates out-of-phase with at least one lower marine vibrator wherein the upper marine vibrator radiates an up-going wave that has reverse polarity to the first down-going-wave that radiates from the lower marine vibrator and the backsides of the vibrators are stationary during operation of the vibrators.

22. *(original)* The apparatus of claim 21 wherein the up-going wave, the first down-going wave, and the third down-going wave contains frequencies of less than 10 Hz.

23. *(original)* The apparatus of claim 21 wherein the backsides of the upper and lower vibrators are connected.

AMENDMENTS TO THE CLAIMS - *(Cont.)*

24. *(original)* The apparatus of claim 11 wherein the device is a rigid plate which serves as reaction mass and backplane below the surface of the water and the means for causing oscillations in the water is at least one pistons and at least one corresponding cylinder through the plate and oriented normal to the large surfaces of the plate, the piston pushing directly on the water, the piston adapted to oscillate along the axis of the cylinder when activated and means for activating the piston wherein as at least one piston is pushed down a compression wave is radiated as a down-going wave and rarefaction wave is radiated as an up-going wave, wherein the compression wave is the first down-going wave and the rarefaction wave is the up-going wave.

25. *(original)* The apparatus of claim 24 wherein the up-going wave, the first down-going wave, and the third down-going wave contains frequencies of less than 10 Hz.

26. *(original)* A marine seismic source apparatus comprising;

a seismic source device wherein at least part of the device is below the surface of the water and the device creates an up-going wave and a first down-going wave, wherein the up-going wave is substantially near the surface of the water and has enough energy to break through the surface of the water into the atmosphere wherein there is no significant wave reflected off the surface of the water and the first down-going wave is the only significant down-going wave produced by the source.

27. *(currently amended)* The apparatus~~method~~ of claim 26 wherein the source device is an airgun located near the surface of the water and the collapsing air pocket is blown out of the water.

28. *(currently amended)* The apparatus~~method~~ of claim 26 wherein the first down-going wave contains frequencies of less than 10 Hz.